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Bioaccumulation and Ecotoxicity of Carbon Nanotubes

Kühnel, Dana; Jacokson, Petra; Raun Jacobsen, Nicklas; Baun, Anders; Birkedal, Renie; Alstrup Jensen, Keld; Vogel, Ulla Birgitte; Wallin, Håkan

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TU175 Bioaccumulation and Ecotoxicity of Carbon Nanotubes D. Kühnel, HelmholtzCentre for Environmental Research; P. Jackson, National Research Centre for the Working Environment NRCWE; N.R. Jacobsen, National Research Centre for the Working Environment NRCEW; A. Baun, Technical University of Denmark / Department of Environmental Engineering; R. Birkedal, K.A. Jensen, U.B. Vogel, H. Wallin, National Research Centre for the Working Environment NRCWE. A review of the existing literature on ecotoxicity of CNT has been performed and the results are presented here. Several studies provide evidence that CNT do not cross biological barriers readily. When ingested by living organisms, CNT are subsequently excreted. When internalized, only a minimal fraction translocates into other body compartments. Thus bioaccumulation is limited; however organisms containing CNT may become source of entry of CNT into the food chain, potentially leading to biomagnification. Toxicity depends on exposure, model organism, CNT type and dispersion state. Aquatic organisms are more affected than terrestrial organisms. Invertebrates are more sensitive than vertebrates, with single-walled CNT being more toxic than multi-walled CNT. CNT length and dispersion degree play a role for the toxic outcome. It can be assumed that the ratio length/diameter also plays a role. Hence, the fiber or tube form is an important parameter in toxic outcome, leading to indirect and direct effects on organisms. Direct mechanical effects were observed in plants, bacteria, and fish, were the CNT pierced and consequently damaged cells. Indirect mechanical effects were observed in algae, crustaceans or insects, where an interaction with the outer body surface occurred, leading to interference with growth and movement. For the assessment of ecotoxicological effects of CNT, the exposure scenario and exposure route has to be derived from the CNT application, use of stabilizers or surface modifications. Here, two scenarios are possible. First, the CNT are kept stable in well-defined test system, where stabilizers may be acceptable. Second, as an environmentally relevant scenario, agglomeration may be accepted. Exposure characterization is an essential part of result reporting, The effect concentrations are above current environmental concentrations and more robust data are needed for future estimates. Future studies with benchmark materials have to clarify uncertainties about exposure/effect relationships. Keywords: environmental organisms, CNT, bioaccumulation Reference: Jackson **P. et al. (2013), Bioaccumulation and ecotoxicity of carbon nanotubes.** C*hemistry Central Journal* 2013, **7**:154